cc:LWLindquist(w/o at
REWelch (w.att)
MOVarner(w/o att)

ASARCO

RNTSF
1,1,2 VI

Department of Environmental Sciences

M. O. Varner
Director

November 16, 1983

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Mr. Jon Schweiss
Quality Control Officer
EPA Region X
Mail Stop 345
1200 Sixth Avenue
Seattle, Washington 98101

Dear Sir:

Pursuant to our discussions regarding operation of Asarco's low-vol monitoring network, I am providing additional information that I hope will assist you in evaluating the system. Please find the following documents which I have attached:

1. Description of Low-Volume sampling system.

2. Description of a scheme for insuring the quality of ambient monitoring samples.

3. Typical field service report for instrument inspections and calibrations.

4. Hi-Vol/Low Vol comparisons.

5. Digestion procedures for ambient monitoring filters.

6. Comparison of data from horizontal and vertical low-vol heads (these were only operated for a short period of time).

As I indicated, I believe that the low-vol system has provided consistent data over the years and, although the field sampling protocol was scrutinized to a lesser degree than the laboratory protocol, I still maintain that trends and levels reflected by low-volume sampling are real.

Please let me know if I can provide additional information.

Very truly yours,

Donald A. Robbins
Supervisor of Environmental Sciences

DAR/bjs
Attach.

LOW VOLUME AIR SAMPLING

The low volume particulate sampling train should be installed as shown in Figure 1. The connections between the filter head, dry test meter, and vacuum pump can be made using vacuum hose or ¼" I.D. galvanized pipe. The filter head (see Figure 2), should be positioned under the eave of the shelter. It can be placed in either a vertical or horizontal position.

When changing filters, it is important to remember that the two filters are weighed together and placed in the same plastic bag. Either one of the two filters may be removed from the bag and placed in the sample head for collection of the particulate matter in the air. The other filter is left in the bag and will be placed on the dirty surface of the exposed filter when it is removed. The same two filters in any one bag must be kept together and must not be mixed with filters from any other bag. When placing a filter in the sampling head, the pump should be running. This helps avoid tension on the filter and avoids possible damage to it.

Should the dust burden become too great, the filter may not be able to retain all of the particulate matter on its surface. It is, therefore, imperative that the filters be changed as often as is needed to eliminate this problem. Generally, the filters will run from one to two weeks depending on the partic-

ulate loading of the air. However, any length of time less than two weeks is acceptable as long as the "on and off" dates and gas meter readings are recorded and no particulate is lost from the filter.

Not all of the Asarco operations utilize the same type of vacuum pump. The most commonly used pump is the Gelman Little Giant. This pump should be capable of drawing approximately one cubic foot of air/min (cfm). An acceptable range in air flow for this pump is from 0.5 to 1.0 cfm. If the particular pumps you are using do not meet these specifications, they should be returned to the Department of Environmental Sciences in Salt Lake City to the attention of Mr. G. H. Ryser and accompanied with a brief explanation of the problem encountered.

During each visit to the sampling location, the following items should be checked:

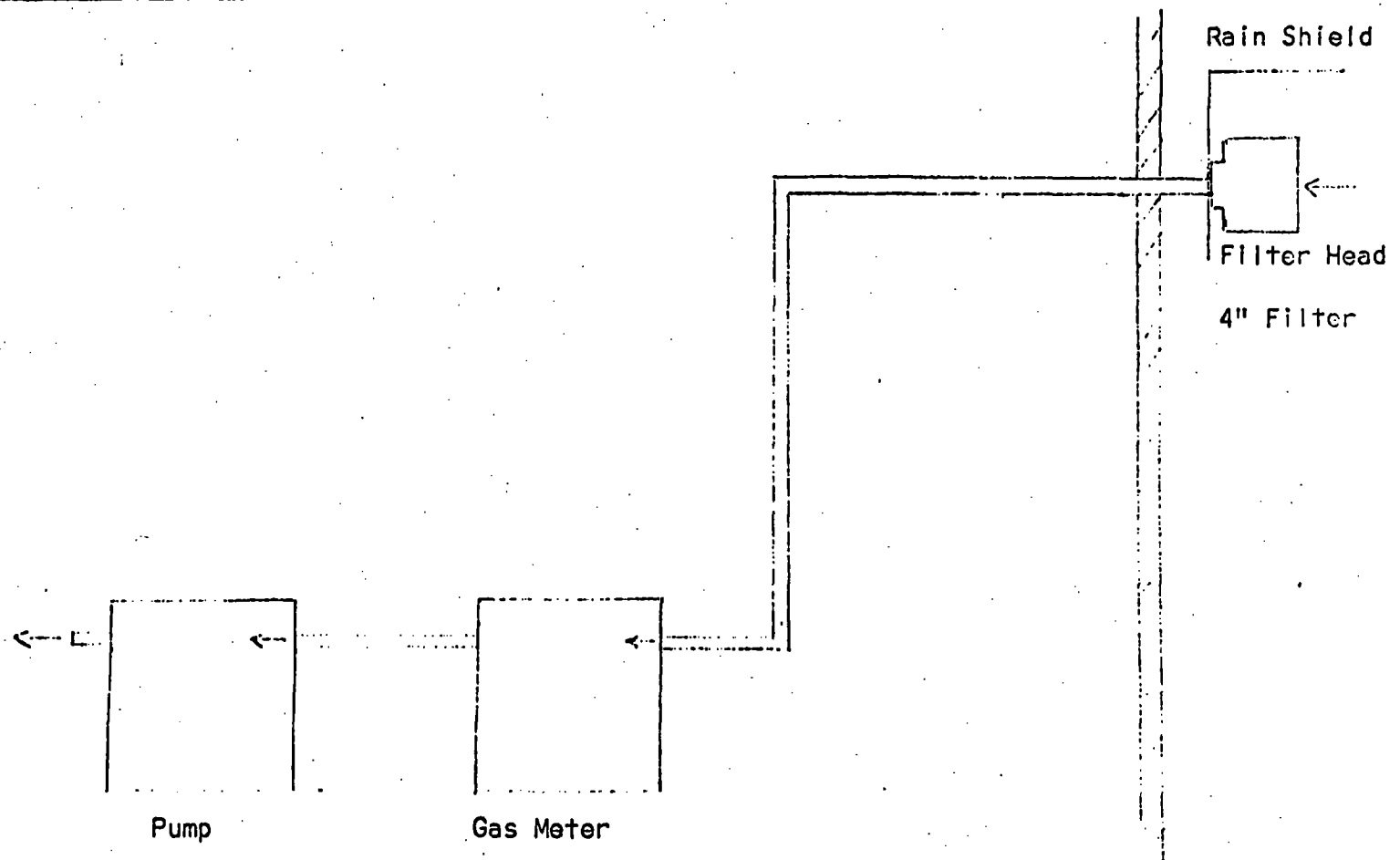
(1) Inspect the air line for leaks

(2) Inspect gaskets on the sample head and replace if needed. The length of time the gasket will last is dependent on the area in which it is used. The thick gasket (¼") replaces the one on the cap. The thin gasket (1/8") replaces the one inside the head under the support screen.

(3) Make a five-minute flowrate check on the pump. If the flowrate of air is not approximately what it should be, find out why. Note that a pump drawing air at a rate of 1 acfm will draw 1440 acf/day.

Any questions with regard to standard operating procedure should be directed to Mr. M. R. Olsen, Department of Environmental Sciences.

LOW-VOL SAMPLING ARRANGEMENT



Single Piston Pump - Adjust to approx. 1 cu ft/min.

Double Piston Pump - Adjust to approx. 2 cu ft/min.

FIGURE 1

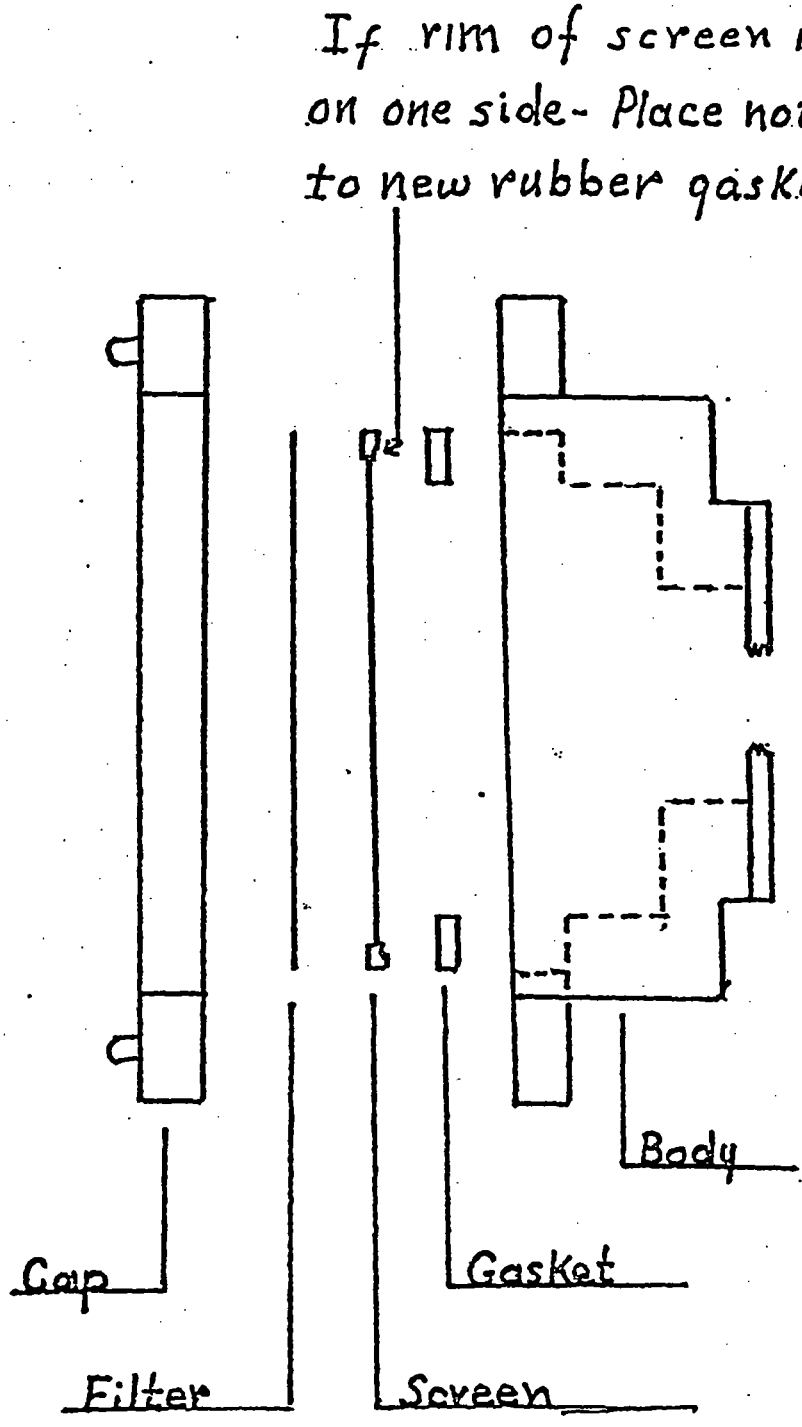
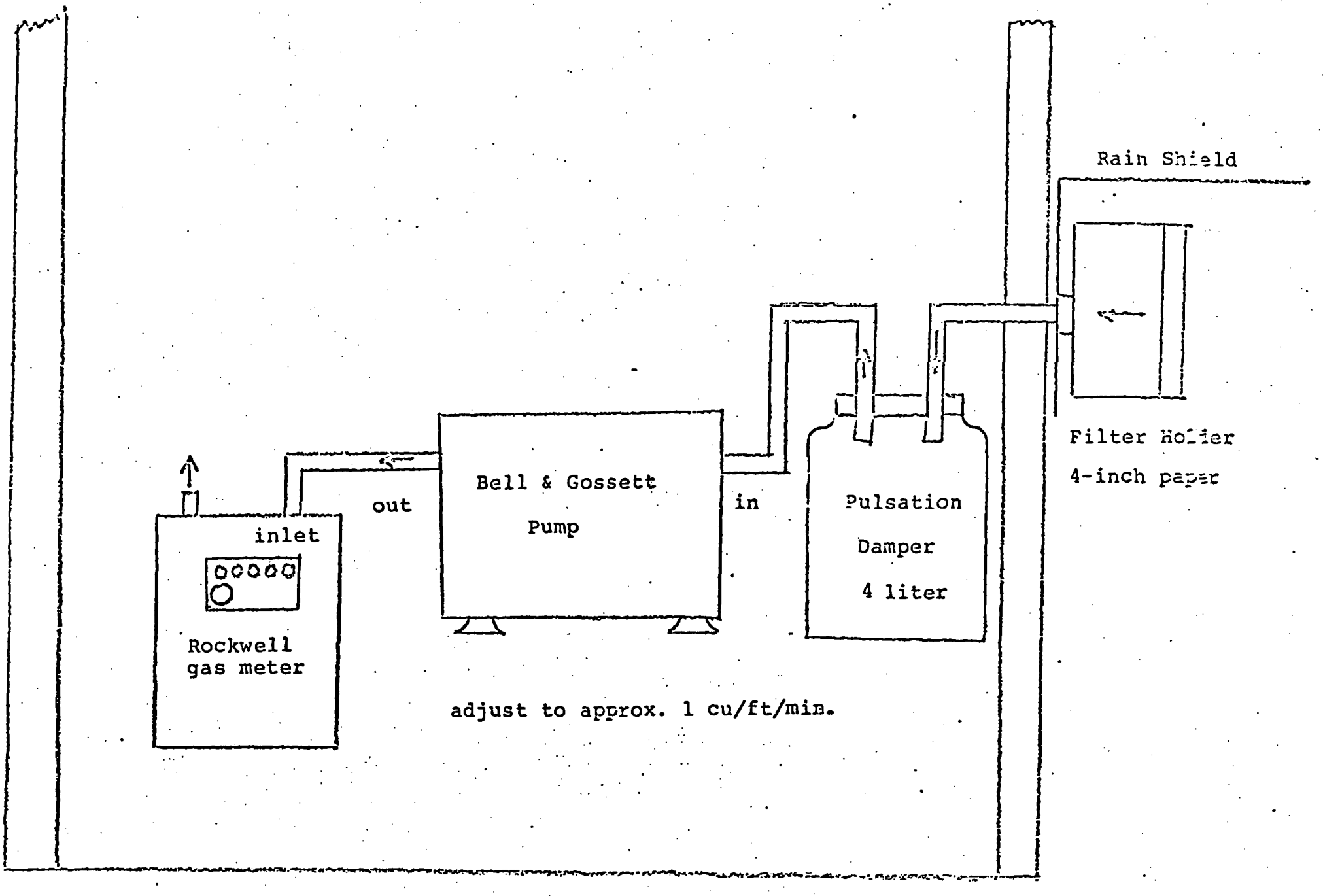

If rim of screen is notched on one side- Place notches next to new rubber gasket.
Body
Cap
Gasket
Filter
Screen

FIGURE 2

FILTER PAPER SUCTION DIAGRAM



December 15, 1976

Mr. S.M. Lane - East Helena

Mr. W.R. Kelly - El Paso

Mr. C.B. White - Corpus Christi

Mr. H.R. Wampler - Columbus

Mr. C. F. Bates - Glover

Mr. L. G. Cahill - Hayden

Mr. A. L. Labbe - Tacoma

Mr. L. D. Alpert - Whiting

Low-Volume Sampling Log

As I am sure you are aware, there are a number of low-volume sampling installations included in the ambient air monitoring network surrounding your plants. At various times there have been problems with regard to correct sampling dates, correct sampling volumes, and pertinent comments on sampling conditions. These problems have not diminished in number.

Trying to resolve these problems over the telephone and after several weeks or months after the fact is not easy and many times data is completely lost. As a possible remedy to this problem, I am suggesting that the individual responsible for the low-volume stations begin keeping a log for each station. This log should be similar in form to the sample below.

SAMPLE DATE		GAS METER READING		AIR VOLUME	
On	Off	On	Off	ft^3	COMMENTS

If this log is kept, the technician can see at a glance whether the sample volumes are remaining constant. This log will act very similarly to a quality control chart in the analytical laboratory.

As an example: most pumps on the low-vol system run at 1 cfm. For a one-day period, the gas meter should register 1440 ft^3 or 10080 ft^3 for one week. If the technician observes volumes for one-week samples running at approximately 10,000 ft^3 for six months and suddenly finds a sample volume of 250 ft^3, he can immediately search for mechanical problems, subtraction errors, meter reading errors, or recording errors.

If the sample data sent to the Environmental Science Laboratory is monitored in this manner, I feel the quality and consistency of the surveillance will be much improved. If I can help in any way to develop this procedure, please feel free to call on me.

Donald A. Robbins
Chief Chemist

DAR/bjs

cc: MOVarner
MROlsen

ASARCO

MOV
DAR
LDW
SGC
JBR
SDS
RCM
GEW

Department of Environmental Sciences

M. O. Varner
Manager

July 29, 1982

Mr. M. O. Varner
Building

Annual Field Service Work
Tacoma Area

Instrument inspections and calibrations were made at each of the ambient air SO_2 monitors and stack monitor from July 6 to July 16, 1982. Necessary repairs were made and all possible preventive maintenance was accomplished.

A general maintenance program was performed which consisted of cleaning and calibrating the cell and electrodes. The recorders and analyzers were inspected and any worn or faulty parts were replaced. The Rockwell gas meters used in the low-volume sampling systems and analyzers were calibrated against our secondary standard.

An absorption cell check was made at each of the stations using standard solutions of H_2SO_4. A seven point dynamic calibration was made at each of the Asarco Model 600 (0-1 ppm) ambient SO_2 monitors using a Metronics dynacalibrator utilizing permeation tubes certified at $\pm$ 2% error. These tests indicated that all monitors were operating within tolerance. The results of the calibrations can be found on Attachment #1. A problem developed with the oven in the Metronics unit, and temporary repairs were made to facilitate calibration. The unit has since been returned for permanent repair.

Details of specific maintenance work, as well as calibration data, can be found on the attached field service work sheets.

John J. Ribbens

John J. Ribbens
Environmental Instrumentation Technician

JJR/lb

cc: KWNelson (w/attach.#1)
DARobbins "
LWLindquist "
REWelch (w/all attach.)

PLANT Tacoma STATION Reservoir DATE 7/7/82

CALIBRATION OF ROCKWELL GAS METERS: Low-Vol Air Sampler - Found 1.6% Slow Corrected Within.5%

Analyzer - Found Within.5% Corrected -

ELECTRODES AND CELL: Cleaned Cell and Electrodes X Adjusted Electrodes X

Standard Solution		Normal Reading	Found	Corrected
.000083N	=	.25 ppm	.244 ppm	.25 ppm
.000042N	=	.125 ppm	.126 ppm	-
.000166N	=	.5 ppm	.497 ppm	-

Dynamic Calibration:		
0 ppm Introduced	0	ppm Result
.142 ppm Introduced	.150	ppm Result
.293 ppm Introduced	.298	ppm Result
.420 ppm Introduced	.412	ppm Result
.618 ppm Introduced	.599	ppm Result
.728 ppm Introduced	.711	ppm Result
.885 ppm Introduced	.799	ppm Result
ppm Introduced		ppm Result

ANALYZER:
- Replaced Tubing as Needed: X
- Adjusted Air Flow: X
- Checked Probe: X
- Screen: -
- Cleaned Stopcocks: X
- Rotameter Setting: X

RECORDER:
- Cleaned and Greased Chart Drive & Balancing Motor: X
- Cleaned Slide Wires: X
- Cleaned and Refilled Ink Reservoirs: X
- Line Calibration: -
- Cleaned and Adjusted Margin Pen Relays: X
- Oiled and Cleaned Recorder as Needed: X
- Checked Balance Sensitivity on Amplifier: X
- Replaced Tubes in Amplifier No. ___: -
- Checked Zero Off-Set on Amplifier: X

LOW-VOL AIR SAMPLER:
- Checked Air Volume - 1 cu.ft./min.: X
- Leakage Around Filter Head: X
- Replace Tubing as Needed: X

REMARKS: Replaced 'O' Rings on Stopcock assembly.
Replaced Lo-Vol Head Gaskets.
Leak Tested Lo-Vol system.

ANNUAL FIELD SERVICE WORK

PLANT Tacoma STATION Vashon Island DATE 7/9/82

CALIBRATION OF ROCKWELL GAS METERS: Low-Vol Air Sampler - Found 1.6% Slow Corrected Within.5%

Analyzer - Found Within.5% Corrected -

ELECTRODES AND CELL: Cleaned Cell and Electrodes X Adjusted Electrodes X

Standard Solution		Normal Reading	Found	Corrected
.000083N	=	.25 ppm	.244 ppm	.25 ppm
.000042N	=	.125 ppm	.125 ppm	-
.000166N	=	.5 ppm	.498 ppm	-

Dynamic Calibration:				
0	ppm Introduced	0	ppm Result	
.141	ppm Introduced	.160	ppm Result	
.291	ppm Introduced	.306	ppm Result	
.412	ppm Introduced	.433	ppm Result	
.613	ppm Introduced	.636	ppm Result	
.714	ppm Introduced	.752	ppm Result	
.869	ppm Introduced	.927	ppm Result	
	ppm Introduced		ppm Result	

ANALYZER:
- Replaced Tubing as Needed: X
- Adjusted Air Flow: X
- Checked Probe: X
- Screen: -
- Cleaned Stopcocks: X
- Rotameter Setting: X

RECORDER:
- Cleaned and Greased Chart Drive & Balancing Motor: X
- Cleaned Slide Wires: X
- Cleaned and Refilled Ink Reservoirs: X
- Line Calibration: -
- Cleaned and Adjusted Margin Pen Relays: X
- Oiled and Cleaned Recorder as Needed: X
- Checked Balance Sensitivity on Amplifier: X
- Replaced Tubes in Amplifier No. ____: -
- Checked Zero Off-Set on Amplifier: X

LOW-VOL AIR SAMPLER:
- Checked Air Volume - 1 cu.ft./min.: X
- Leakage Around Filter Head: X
- Replace Tubing as Needed: X

REMARKS: Replaced Lo-Vol head gaskets.
Lead tested Lo-Vol system.

D.O.E.S. LABORATORY - Salt Lake City

Comparison
Hi-Vol - LoVol Air Sampling Systems

Date		LEAD ($\mu g/m^3$)		PARTICULATE ($\mu g/m^3$)	
On	Off	Lo-Vol	Hi-Vol	Lo-Vol	Hi-Vol
11/27/79	11/28/79	1.18	1.37	94.8	85.8
11/28/79	11/29/79	0.95	1.12	97.2	120.6
11/29/79	11/30/79	0.95	1.31	109.8	102.8
12/3/79	12/4/79	2.86	3.02	186.2	180.0
12/4/79	12/5/79	1.19	1.19	109.5	104.6
12/5/79	12/6/79	1.43	1.40	83.3	88.3
12/6/79	12/7/79	0.95	1.00	85.7	91.0
12/10/79	12/11/79	1.90	0.48	47.6	56.9
12/11/79	12/12/79	0.70	0.89	67.9	68.7
12/12/79	12/13/79	1.17	2.16	133.8	128.3
12/13/79	12/14/79	2.06	1.79	149.1	141.9

Filters: Lo-Vol - Gelman DM-800, 102 mm diameter

Hi-Vol - Gelman Spectrograde Glass, 8" x 10"

This comparison sampling should be repeated at other locations to verify these results. Probably, the sampling should be done around some of the ASARCO Plants.

I. LOW VOL

A. DM800 (PVC):

1. Preparation

Each sample is assigned a laboratory identification number and weighed when received in the laboratory. One fourth of the filter and its cover filter is taken and placed into a labelled 125 ml erlenmeyer flask. Mercury and sulfate analysis each require a quarter of the filter and its cover. These filters are placed in a 125 ml erlenmeyer flask and are analyzed in accordance with the procedures found in the section on methods of analysis.

2. Digestion

10 mls of acid mix (15% $HClO_4$ - 85% HNO_3) is added to the flask. (If the total filter is used, put 20 mls acid mix in flask). Digest sample on hot plate set on high heat. Heat sample until dense white $HClO_4$ vapor fills flask. Remove from heat and let cool. One fourth filter samples are normally made to a volume of 50 mls. (PVC filters are sometimes difficult to digest. Do not leave these samples unattended).

B. TCM 1200 (metricel):

1. Preparation

Each sample is assigned a laboratory identification number and weighed when received in the laboratory. One fourth of the filter and its cover filter is placed into a labelled 125 ml erlenmeyer flask.

2. Digestion

10 mls of acid mix (15% $HClO_4$ - 85% HNO_3) is added to the flask. (If total filter is used, put 20 mls acid mix in flask). Set hot plate on high. Heat samples until white $HClO_4$ vapor fills flask. Remove from heat, let cool. One fourth filter samples are normally made to a volume of 50 mls.

II. HIGH VOL

A. High Vol. Filter (8x10 (Total)):

1. Preparation

Each sample is assigned a laboratory identification number and weighed if total particulate is required. One fourth of the filter is placed into a labelled teflon beaker.

2. Digestion

20-30 mls acid mix (15% $HClO_4$ - 85% HNO_3) + 3-5 mls HF is added to each beaker. Set hot plate on high. Heat sample until dense white $HClO_4$ vapor fills beaker. Remove from heat, let cool. One fourth filters samples are normally made to a volume of 50 mls.

B. High Vol. Filter (8x10) (E.P.A.):

1. Preparation

Hot extraction procedure. Cut a 3/4" x 8" strip from the exposed filter using a template and a pizza cutter as described in figures 1 and 2. Other cutting procedures may be used. Lead in ambient particulate matter collected on glass fiber filters had been shown to be uniformly distributed across the filter (1, 3, 11) suggesting that the position of the strip is unimportant. However, another study (12) has shown that when sampling near a roadway, lead is not uniformly distributed across the filter. The nonuniformity has been attributed to large variations in particle size (16). Therefore, when sampling near a roadway, additional strips at different positions within the filter should be analyzed. Fold the strip in half twice and place in a 150 ml beaker. Add 15 ml of 3M HNO_3 to cover the sample. Cover the beaker with a watch glass. Place beaker on the hot plate, contained in a fume hood, and boil gently for 30 minutes. Do not let the sample evaporate to dryness. Caution: Nitric acid fumes are toxic. Remove beaker from hot plate and cool to near room temperature. Quantitatively transfer the sample as follows: Rinse watch glass and sides of beaker with deionized water. Decant extract and rinsings into a 100 ml volumetric flask. Add deionized water to 40 ml mark on beaker, cover with watch glass, and set aside for a minimum of 30 minutes. This is a critical step and cannot be omitted since it allows the HNO_3 trapped in the filter to diffuse into the rinse water. Decant the water from the filter into the volumetric flask. Rinse filter and beaker twice with deionized water and add rinsings to volumetric flask until total volume is 80 to 85 ml. Stopper flask and shake vigorously. Set aside for approximately 5 minutes or until foam has dissipated. Bring solution to volume with deionized water. Mix thoroughly. Allow solution to settle for one hour before proceeding with analysis. If sample is to be stored for subsequent analysis, transfer to a linear polyethylene bottle.

C. Impinger:

Impinger samples are given a laboratory identification

number and are analyzed as received for SO_2 in accordance with the procedure found in methods of analysis section.

COMPARISON OF DATA FROM HORIZONTAL AND VERTICAL LOW-VOL HEADS

(Salt Lake City Station)

1975 Date		µg Pb/m^3	µg Particulate/m^3
10/23 - 10/30	Vertical	.96	42.8
	Horizontal	.91	43.9
10/30 - 11/6	Vertical	1.89	94.5
	Horizontal	2.51	101.8
11/6 - 11/13	Vertical	1.26	45.3
	Horizontal	1.12	50.1
11/13 - 11/20	Vertical	2.26	89.0
	Horizontal	1.86	90.9
11/20 - 12/4	Vertical	1.02	60.8
	Horizontal	1.04	67.8
12/4 - 12/11	Vertical	2.12	123.0
	Horizontal	2.21	122.7
1979 Date			
12/14/78 - 1/4	Vertical	.94	69.8
	Horizontal	.90	69.9
1/4 - 1/19	Vertical	.72	62.4
	Horizontal	.87	62.7
1/19 - 2/8	Vertical	.83	66.0
	Horizontal	1.04	73.0

HEAD IN SIDE OF SHACK